

Therefore, according to the present invention, the tilt of the image of the screen is corrected in the normal manner. On the other hand, in the cases of the standby mode, the suspend mode or the power-off mode, the tilt correcting coil does not consume any power, thereby satisfying the power consumption definition of the power-off mode.

BRIEF DESCRIPTION OF THE DRAWINGS

The above object and other advantages of the present invention will become more apparent by describing in detail the preferred embodiment of the present invention with reference to the attached drawings in which:

FIG. 1 illustrates an embodiment of a circuit to which the method for controlling the power consumption according to the present invention is applied; and

FIG. 2 is a signal flow chart showing the operation of the microcomputer of FIG. 1, which is used for controlling the power consumption according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, a circuit for controlling the power consumption comprises: a microcomputer 20 for controlling the DPMS operations of a monitor in accordance with the presence and absence of horizontal and vertical synchronizing signals input from a computer system, and for setting a tilt correcting value for the images of the screen in accordance with key signals of a keyboard and outputting a tilt correcting pulse width modulated (PWM) signals; an integrator 30 for converting the tilt correcting PWM signals output from microcomputer 20 to dc voltages; a tilt correcting signal outputting section 40 for amplifying the output voltages of integrator 30 to output tilt correcting signals; and a tilt correcting coil 50 for correcting the tilt of the images of the screen in accordance with the output voltages of tilt correcting signal outputting section 40.

Integrator 30 includes a resistor R1 connected to a ground terminal via a capacitor C1. An output terminal of microcomputer 20 is connected to a resistor R2 of tilt correcting signal outputting section 40 via resistor R1.

Tilt correcting signal outputting section 40 is constituted as follows. An output terminal at the node connecting resistor R1 and capacitor C1 of the integrator 30 is connected via resistor R2 to an inverting input terminal (-) of an arithmetic amplifier OP1. A dividing circuit comprised of a resistor R3 and a resistor R4 connected in series between a power source B+ and the ground terminal. A connection node between resistors R3 and R4 is connected to a non-inverting input terminal (+) of the arithmetic amplifier OP1. An output terminal of the arithmetic amplifier OP1 is connected through a feedback resistor R5 to its inverting input terminal (-). At the same time, the output terminal of the arithmetic amplifier OP1 is also connected to a non-inverting input terminal (+) of another arithmetic amplifier OP2. An output terminal of the arithmetic amplifier OP2 is connected through a capacitor C2 to a grounding resistor R7. A connection node between capacitor C2 and resistor R7 is connected to the inverting input terminal (-) of arithmetic amplifier OP2 via a feedback resistor R6. Capacitor C2 is connected in parallel to tilt correcting coil 50. Accordingly, one terminal of tilt correcting coil 50 is connected to the output terminal of arithmetic amplifier OP2 and the other terminal of tilt correcting coil 50 is connected to the inverting terminal (-) of arithmetic amplifier OP2 via feedback resistor R6.

FIG. 2 is a signal flow chart showing the operation of microcomputer 20 which is used for controlling the power consumption according to the present invention.

At a step S1, once the computer system is initially started or after a resetting operation, microcomputer 20 receives horizontal and vertical synchronizing signals from the computer system in a normal on-state mode. At steps S2-S4, the microcomputer 20 determines whether horizontal and vertical synchronizing signals are being input from the computer system.

If horizontal synchronizing signals are found to be input at the step S2, and if vertical synchronizing signals are found to be input at the step S3, then it is determined that the computer system operates is operating under the on-state mode. Therefore, at a step S5, the on-state mode of the monitor is set, and at step S6, microcomputer 20 outputs the tilt correcting PWM signal having a duty ratio corresponding to a pre-set tilt correcting value. The tilt correcting PWM signal output from microcomputer 20 is converted into a dc voltage by integrator 30, and the dc voltage of the tilt correcting PWM signal is supplied through the resistor R2 of tilt correcting signal outputting section 40 to the inverting input terminal (-) of arithmetic amplifier OP1. The power source B+ is divided by resistors R3 and R4, and this divided voltage is supplied to the non-inverting input terminal (+) of arithmetic amplifier OP1. Then arithmetic amplifier OP1 compares the divided voltage with the dc voltage level output from integrator 30, amplifies it and inverts it. The output signal of arithmetic amplifier OP1 is amplified again by arithmetic amplifier OP2. Then it is supplied to tilt correcting coil 50, so that the tilt of the images on the screen can be corrected.

Meanwhile, if it is determined at step S2 that the horizontal synchronizing signals are input, and if it is determined at step S3 that vertical synchronizing signals are not input, then microcomputer 20 sets the monitor in the suspend mode at a step S7.

If it is determined at step S2 that the horizontal synchronizing signals are not input, then at step S4, it is determined whether or not the vertical synchronizing signals are input from the computer system. If it is determined at step S4 that vertical synchronizing signals are input, then microcomputer 20 sets the monitor in the standby mode at step S8. If it is determined that the vertical synchronizing signals are not input at step S4, then microcomputer 20 sets the monitor in the power-off mode at a step S9.

Following the steps of setting the monitor in the standby mode (S8), the suspend mode (S7) or the power-off mode (S9), then at step S10 microcomputer 20 withholds, or does not generate, the tilt correcting PWM signals. That is, microcomputer 20 outputs a high potential continuously. When microcomputer 20 outputs the continuous high potential, integrator 30 continuously outputs a high potential, and this high potential is supplied through resistor R2 of tilt correcting signal outputting section 40 to the inverting input terminal (-) of arithmetic amplifier OP1. Then arithmetic amplifier OP1 outputs a continuous low potential, and arithmetic amplifier OP2 outputs a low potential, with the result that no electric current flows through tilt correcting coil 50.

According to the present invention as described above, in the case of the standby mode, the suspend mode and/or the power-off mode, that is, if there is no image on the screen, no electric current flows through the tilt correcting coil. Consequently, the power consumption of the monitor is reduced, and the DPMS definition for the power-off mode can be satisfied as to its power consumption.

What is claimed is:

1. A method for controlling power consumption in a tilt correcting coil of a monitor connected to a computer, said method comprising the steps of:

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determining whether synchronization signals are received by said monitor from said computer;

operating said monitor in an on-state mode of a power supply mode of a display power management system (DPMS) when it is determined that said synchronization signals are received by said monitor;

providing a tilt correcting pulse width modulated signal to said tilt correcting coil when operating said monitor in said on-state mode;

operating said monitor in one of a suspend mode, a standby mode and a power-off mode of said power supply mode when it is determined that said synchronization signals are not received by said monitor; and

preventing said tilt correcting pulse width modulated signal from being provided to said tilt correcting coil when operating said monitor in said one of said suspend, standby and power-off modes.

2. The method as set forth in claim 1, said step of determining whether synchronization signals are received by said monitor from said computer comprising the steps of:

determining whether a horizontal synchronization signal is received by said monitor; and then

determining whether a vertical synchronization signal is received by said monitor.

3. The method as set forth in claim 2, further comprising the steps of:

operating in said on-state mode when it is determined that both said horizontal and vertical synchronization signals are received by said monitor;

operating in said suspend mode when it is determined that said horizontal synchronization signal is received by said monitor and it is determined that said vertical synchronization signal is not received by said monitor;

operating in said standby mode when it is determined that said horizontal synchronization signal is not received by said monitor and it is determined that said vertical synchronization signal is received by said monitor; and

operating in said power-off mode when it is determined that said horizontal synchronization signal is not received by said monitor and it is determined that said vertical synchronization signal is not received by said monitor.

4. A method for controlling power consumption in a tilt correcting coil of a monitor connected to a computer, said monitor being operable in an on-state mode, a suspend mode and a power-off mode of a power supply mode of a display power management system (DPMS), said method comprising the steps of:

determining whether horizontal and vertical synchronization signals are received by said monitor from said computer;

operating said monitor in said on-state mode when it is determined that both of said horizontal and vertical synchronization signals are received by said monitor;

providing a tilt correcting pulse width modulated signal to said tilt correcting coil when operating said monitor in said on-state mode;

operating said monitor in one of said suspend and power-off modes when it is determined that at least one of said horizontal and vertical synchronization signals is not received by said monitor; and

preventing said tilt correcting pulse width modulated signal from being provided to said tilt correcting coil when operating said monitor in said one of said suspend and power-off modes.

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5. The method as set forth in claim 4, further comprising the steps of:

operating in said suspend mode when it is determined that said horizontal synchronization signal is received by said monitor and it is determined that said vertical synchronization signal is not received by said monitor;

operating in a standby mode when it is determined that said horizontal synchronization signal is not received by said monitor and it is determined that said vertical synchronization signal is received by said monitor; and

operating in said power-off mode when it is determined that said horizontal synchronization signal is not received by said monitor and it is determined that said vertical synchronization signal is not received by said monitor.

6. An apparatus for controlling power consumption in a tilt correcting coil of a monitor connected to a computer, said monitor being operable in any one of an on-state mode, a suspend mode, a standby mode and a power-off mode of a power supply mode of a display power management system (DPMS), said apparatus comprising:

a microcomputer in said monitor for receiving horizontal and vertical synchronizing signals output from said computer;

an integrator for receiving and converting a tilt correcting pulse width modulated signal output from said microcomputer into a direct current voltage signal;

a tilt correcting signal output circuit for outputting an amplified voltage signal by amplifying the direct current voltage signal output from said integrator, said amplified voltage signal being applied to said tilt correcting coil.

7. The apparatus as set forth in claim 6, said microcomputer outputting said tilt correcting pulse width modulated signal when both said of horizontal and vertical synchronizing signals are output from said computer.

8. The apparatus as set forth in claim 6, said microcomputer outputting a signal having a constant high logic level, when either one said of horizontal and vertical synchronizing signals are not output from said computer, for preventing said tilt correcting coil from consuming power.

9. The apparatus as set forth in claim 6, wherein said microcomputer determines said monitor is to operate in said on-state mode when both said of horizontal and vertical synchronizing signals are output from said computer, and determines said monitor is to operate in one of said suspend, standby and power-off modes when at least one said of horizontal and vertical synchronizing signals is not output from said computer;

said microcomputer outputting said tilt correcting pulse width modulated signal, when said monitor is determined to be operating in said on-state mode; and

said microcomputer outputting a signal having a constant high logic level, when said monitor is determined to be operating in one of said suspend, standby and power-off modes, for preventing said tilt correcting coil from consuming power.

10. The apparatus as set forth in claim 9, wherein said integrator outputs a direct current voltage signal having a high logic level when said microcomputer outputs said signal having a constant high logic level, and said tilt correcting signal output circuit outputs an amplified voltage signal having a constant low logic level in response to said direct current voltage signal having a high logic level.

11. The apparatus as set forth in claim 6, further comprising:

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said integrator comprising:

a first resistor connected between a first node and said microcomputer, and a capacitor connected between said first node and a ground terminal;

said tilt correcting signal output circuit comprising:

a first amplifier having a negative input terminal, a positive input terminal and an output terminal;

a second resistor connected between said first node and said negative input terminal;

a dividing circuit connected between a power source and said ground terminal for providing a divided voltage signal to said positive input terminal;

a feedback resistor connected between said negative input terminal and said output terminal;

a second amplifier having a negative input terminal, a positive input terminal and an output terminal, said negative input terminal of said second amplifier being connected to said output terminal of said first amplifier;

said output terminal of said second amplifier being connected to a first terminal of said tilt correcting coil;

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a second capacitor connected between said first terminal of said tilt correcting coil and a second terminal of said tilt correcting coil;

a grounding resistor connected between said second terminal of said tilt correcting coil and said ground terminal; and

a second feedback resistor connected between said second terminal of said tilt correcting coil and said negative input terminal of said second amplifier.

12. The apparatus as set forth in claim 6, further comprising:

a keyboard connected to said microcomputer, said microcomputer setting a tilt correcting value for images on a screen of said monitor in accordance with key signals output from said keyboard and outputting said tilt correcting pulse width modulated (PWM) signals in accordance to said tilt correcting value.

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